

Three New Species of New Zealand Tardigrades (Tardigrada: Echiniscidae)

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Professor Walter Maucci (pers. comm.) indicated that the identification of *Pseudechiniscus lateromamillatus* Ramazzotti (1964) in Horning, Schuster and Grigarick (1978) was in error. A re-examination of the New Zealand specimens considered to be variants of *P. lateromamillatus* led to the recognition of three undescribed species.

We have retained these new species in *Pseudechiniscus*. The pseudosegmental area of these species is too large for *Echiniscus* and hardly large enough for *Pseudechiniscus*. These species could be placed in either genus, or a new genus. The problem is confounded by questionable illustrations of named species and the lack of a comparative study of the morphology of this part of the family. Eye pigment is lacking, probably due to the fixation procedures.

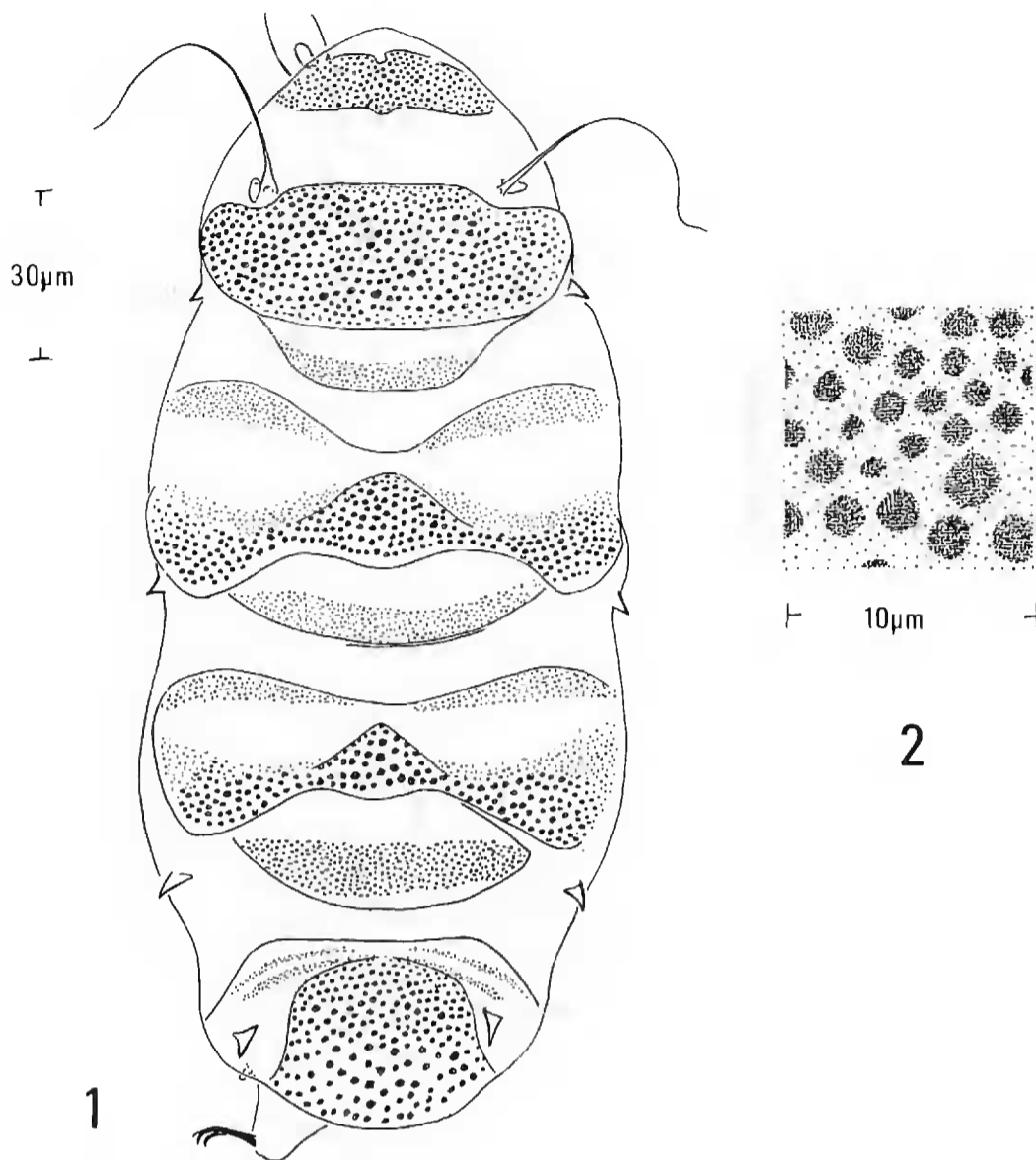
The holotypes of the three new species are deposited in the National Museum of New Zealand, Wellington (NMNZ). Paratypes are deposited in NMNZ and the Department of Entomology Museum, University of California, Davis (UCD). The number of paratypes from any sample is given parenthetically following the NZ sample number. The sample numbers and their associated data have been listed previously (Horning *et al.*, 1978) and, unless otherwise noted, the collector was D. S. Horning, Jr.

We dedicate this article to R. M. Bohart, our mentor for many years, on the occasion of his 70th birthday.

Pseudechiniscus conversus Horning and Schuster, NEW SPECIES (Figs. 1, 2)

Length of dorsum excluding legs IV 188.5 μm ; including legs IV 203 μm . Cuticle with granular pattern; granules largest (1.3–2.5 μm diameter) on scapular plate, median line and posterior margins of plates C and D, and terminal plate; granulation of head plate slightly smaller, and of posterior of third median still smaller; remaining areas (stipple of Fig. 1) with granule diameter 0.3–0.4 μm ; very infrequent light spots (pores) randomly distributed. Head with simple buccal cirri, interior 9.5 μm long, exterior 19 μm ; buccal papilla 6 μm long, 4 μm wide; eye pigment absent. Scapular plate with cirrus A 52 μm long, clava 6 μm long, 3 μm wide. Lateral spines present at positions B, C, D and E, short, triangular, about 6 μm long. Leg I spine bluntly conical, 2.9 μm long; leg IV papilla 3.3 μm long; inner claws of all legs with basal spur.

Discussion.—This species was the basis for the misidentification of *P. lateromamillatus* Ramazzotti in Horning *et al.* (1978). It fits the description of that



Figs. 1, 2. *Pseudechiniscus conversus*. 1, dorsal aspect. 2, detail of scapular cuticle.

species, but examination of a paratype revealed that *lateromamillatus* has pores instead of granules as the major cuticular feature.

The cuticular pattern of diversely sized granules, the largest occurring in precisely limited areas, and the near absence of pores are the most obvious recognitional features of this species.

Etymology.—Latin: *conversus*, opposite; noting the reverse of cuticular characteristics distinguishing the species from *P. lateromamillatus*.

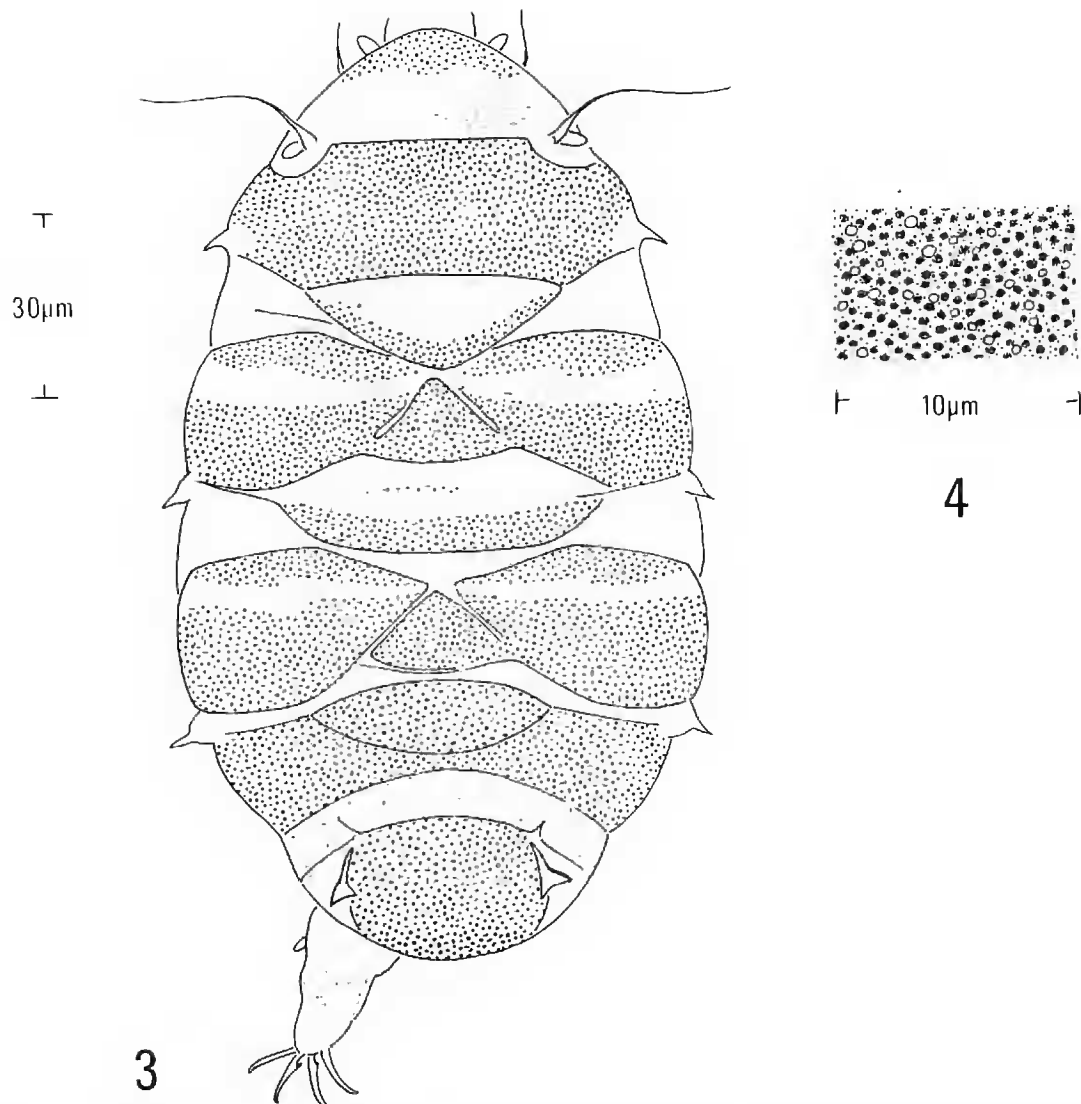
Types.—Holotype and 1 paratype: *South Island*: Canaan Road Terminus, Abel Tasman National Park, 9-IV-1971, NZ 525 (holotype) (NMNZ—Arthropoda 10/32) and NZ 526 (NMNZ).

Habitat.—The holotype was found on the foliose lichen *Lobaria adscripta* (Nyl.) Hue on live *Nothofagus* sp. in a shaded beech forest. The paratype was found on foliose lichens, mostly *Pseudocyphellaria* spp., on live *Nothofagus* in an open, wind-exposed meadow. The sample contained 11 species of tardigrades, the highest number of species found in 577 New Zealand tardigrade-positive samples.

***Pseudechiniscus parvisentus* Horning and Schuster, NEW SPECIES**

(Figs. 3, 4)

Length of dorsum excluding legs IV 157 µm; including legs IV 171 µm. Cuticle of dorsal plates consists of granules and pores of generally uniform size; granules



Figs. 3, 4. *Pseudechiniscus parvisentus*. 3, dorsal aspect. 4, detail of scapular cuticle.

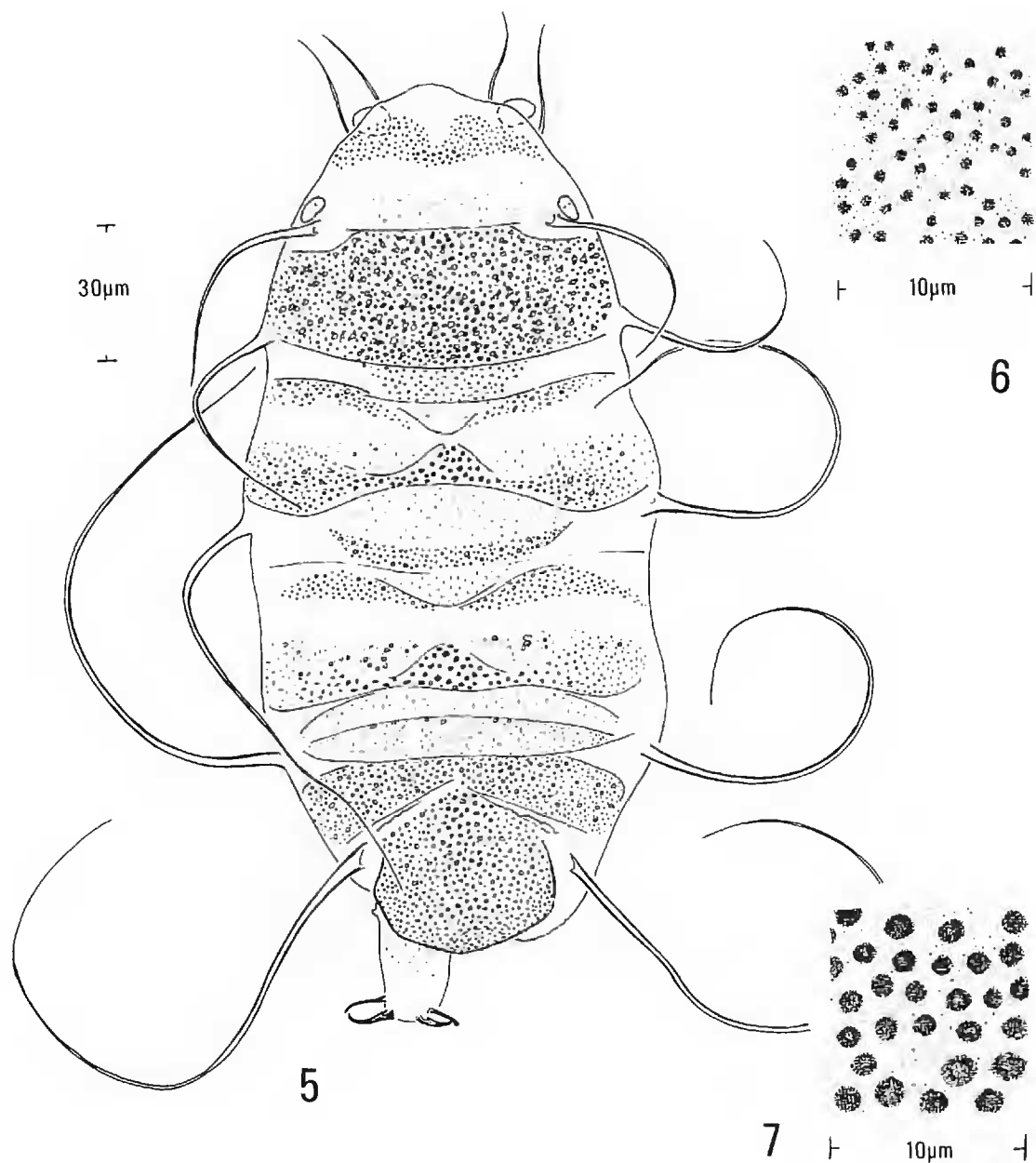
of about $0.3 \mu\text{m}$ diameter. Head with acuminate buccal cirri; interior cirrus $6.7 \mu\text{m}$, exterior $10 \mu\text{m}$ long; buccal papilla $6 \mu\text{m}$ long, $4 \mu\text{m}$ wide; eye pigment absent. Scapular plate with cirrus A $33 \mu\text{m}$ long; papilla $6 \mu\text{m}$ long, $3 \mu\text{m}$ wide. Lateral spines $6 \mu\text{m}$ to $12 \mu\text{m}$ long, thick at base and tapered distally, present at positions B, C, D and E. Leg I spine minute, about $2 \mu\text{m}$ long, $1 \mu\text{m}$ wide; leg IV papilla $3 \mu\text{m}$ long, $2 \mu\text{m}$ wide; internal claws of all legs with basal spur.

Discussion.—This species is similar to *P. conversus* in respect to size and arrangement of spines. However, the pattern of the dorsal plates is uniformly of small granules and pores except that along the posterior margin of the terminal plate the granules are slightly larger and pores are infrequent and obscure.

Etymology.—Latin: *parvus*, little; *sentus*, spine; in reference to the short lateral spines.

Types.—Holotype and 5 paratypes: *South Island*: Otepatotu Bush, Banks Peninsula, 3-XI-1970, NZ 392 (holotype) (NMNZ—Arthropoda 10/33), NZ 596 (1, NMNZ). Additional paratypes: *South Island*, West Harpers Hut, 14 km S Bealey, 12-IV-1971, H. A. Best, NZ 539 (1, NMNZ), NZ 544 (1, UCD); Lewis Pass, 11-V-1970, NZ 106 (1, NMNZ); Halpins Creek, Arthurs Pass National Park, 18-V-1970, NZ 149 (2, NMNZ). *North Island*: Mountain House Road, Mt. Egmont National Park, 23-V-1971, NZ 746 (1, NMNZ), NZ 752 (1, NMNZ); Ohakune Scenic Reserve, 21-V-1971, NZ 711 (3, UCD).

Habitats.—All habitats were in wet *Nothofagus* forests. *Pseudechiniscus par-*



Figs. 5-7. *Pseudechiniscus perplexus*. 5, dorsal aspect. 6, detail of scapular cuticle. 7, detail of terminal cuticle.

visentus was found on mosses on trees and shaded rocks (five samples), foliose lichens, *Sticta* spp., on trees (two samples) and one hepatic sample on a tree.

***Pseudechiniscus perplexus* Horning and Schuster, NEW SPECIES**

(Figs. 5-7)

Length excluding legs IV 193 μm , including legs IV 218 μm . Cuticle of dorsal plates consists of granules generally of about 0.6 μm diameter, and frequent larger, randomly spaced pores; granules larger on median line and posterior margins of plates C and D. Head with acuminate buccal cirri, interior 11 μm long, exterior 23 μm long; buccal papilla 9 μm long, 7 μm wide, eye pigment absent. Scapular plate with cirrus A 58 μm long; clava 7 μm long, 5 μm wide. Lateral spines B, C, D, and E present; approximate lengths of B 80 μm , C 140 μm , D 150 μm and E 170 μm . Leg I with acute spine 3 μm long; leg IV papilla about 4 μm long; inner claws of all legs with basal spur.

Discussion.—The dorsal pattern of this species is pronounced in some areas, similar to the pattern of *P. conversus*, and the presence of both granules and pores is similar to the cuticle of *P. parvisentus*.

Etymology.—Latin: *perplexus*, intricate; for the beautifully intricate pattern of bright and dark spots of the cuticle.

Types.—Holotype: *South Island*: Goulard Downs Hut, Heaphy Track, 12-IX-1971, Margaret E. Miller, NZ 1109 (NMNZ—Arthropoda 10/34). Paratypes: *South Island*: Halpins Creek, Arthurs Pass National Park, 12-X-1970, NZ 373 (1, NMNZ); Canaan Road Terminus, Abel Tasman National Park, 9-IV-1971, NZ 526 (2, NMNZ; 3, UCD).

Habitats.—This species was found on foliose lichens, mostly *Pseudocyphellaria* spp., on live trees and shrubs. It was also found with *Pseudechiniscus conversus* (NZ 526).

KEY TO NEW ZEALAND *PSEUDECHINISCUS*

1. Dorsal plates B, C, D and E with lateral spines 2
- Dorsal plates B, C, D and E without lateral spines 4
2. Dorsal plate pattern almost entirely granules, pores infrequent
..... *P. conversus* Horning and Schuster, n. sp.
- Dorsal plate pattern of both granules and frequent pores 3
3. Lateral spines short (6 to 12 μm)
..... *P. parvisentus* Horning and Schuster, n. sp.
- Lateral spines long (80 to 150 μm)
..... *P. perplexus* Horning and Schuster, n. sp.
4. Pseudosegmental plate with simple posterior margin
..... *P. s. suillus* (Ehrenberg)
- Pseudosegmental plate with 2 broad, short spines on posterior margin
..... *P. n. novaezeelandiae* (Richters)

ACKNOWLEDGMENTS

Professor Walter Maucci kindly arranged the loan of a paratype specimen of *Pseudechiniscus lateromamillatus* from the Istituto Italiano di Idrobiologia, Palanza, and Dr. Diane Nelson examined the specimens and illustrations and critically read the manuscript.

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